

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE



In re the application of:

Etsuo MINAMINO, et al.

Group Art Unit: 1713

Serial Number: 10/069,791

Examiner: Donald R. Wilson

Filed: February 28, 2002

For: ULTRAVIOLET-CROSSLINKABLE POLYMER COMPOSITION

DECLARATION UNDER 37 CFR 1.132

Commissioner for Patents
Washington, D.C. 20231

Sir:

Etsuo Minamino residing at 4-4-4, Gamou, Joto-ku, Osaka-shi, Osaka, Japan duly deposes and says:

1. That he graduated from Department of Polymer Science and Engineering, Faculty of Textile Science, Kyoto Institute Technology, Kyoto, Japan, in the year 1987.;

2. That since 1989, he has been employed in the capacity of DAIKIN INDUSTRIES, LTD.;

3. That from 1989, he has been engaged in development for polymerization and crosslinking of fluorine-containing rubber, and marketing.;

4. That he has read and is familiar with the instant application for United States Letters Patent and Office Action thereto mailed January 7, 2004.; and

5. That he has made experiments in order to show that a crosslinked article that is excellent in tensile strength, elongation and

100 % modulus (M100) can be obtained when a composition comprising an iodine-containing polymer and a multi-functional unsaturated compound is crosslinked by ultraviolet rays, compared to when a composition comprising a bromine-containing polymer and a multi-functional unsaturated compound is crosslinked by ultraviolet rays.

6. Experiments were carried out by the following procedure.

Experiment 1

100 parts of DAI-EL G902 available from Daikin Industries, Ltd. (a copolymer of vinylidene fluoride, tetrafluoroethylene and hexafluoropropylene, iodine content: 0.25 (% by weight), concentration of reactive sites: 0.20 (%), molecular weight: about 100,000), 4 parts of Irgacure 184 as a photoinitiator and 4 parts of triallylisocyanurate (TAIC) as a multi-functional unsaturated compound (crosslinking aid) were mixed and kneaded using an internal mixer to be homogeneously dispersed. Then, the composition was pressed and pre-molded at a given temperature and a sheet of 0.5 mm thickness was prepared. The concentration of reactive sites is found from the following equation.

Concentration of reactive sites (%) =

$$\text{Content of element (\% by weight)} / \text{atomic mass} \times 100$$

Subsequently, under air break, the sheet was exposed to ultraviolet rays by passing through a conveyer-type ultraviolet ray exposing device to obtain a crosslinked article. The irradiation conditions were ultraviolet ray of 1200 mJ/cm² and ambient temperature of room temperature (about 25°C).

The tensile strength, elongation and M100 of the obtained crosslinked article was measured according to JIS K 6251.

The tensile strength of the crosslinked article was 58 kgf/cm², the elongation was at least 2900 % and M100 was 28 kgf/cm².

Experiment 2

A sheet of 0.5 mm thickness was prepared in the same manner as in Experiment 1, except that 100 parts of Viton GF available from Du Pont Dow ELASTOMERS L.L.C. (a copolymer of vinylidene fluoride, tetrafluoroethylene and hexafluoropropylene, bromine content: 0.54 (% by weight), concentration of reactive sites: 0.68 (%), molecular weight: about 100,000) was used instead of DAI-EL G902, and then exposed to ultraviolet rays by passing through a ultraviolet ray exposing device to obtain a crosslinked article. The obtained crosslinked article was measured for tensile strength, elongation and M100 in the same manner as in Experiment 1.

The tensile strength of the crosslinked article was 25 kgf/cm², the elongation was 720 % and M100 was 10 kgf/cm².

Results and Discussion

From the fact that the concentration of reactive sites of DAI-EL G902 used in Experiment 1 is 0.20 (%) and the concentration of reactive sites of Viton GF used in Experiment 2 is 0.68 (%), it is evident that Viton GF has more than 3 times more crosslinking points than DAI-EL G902. Nevertheless, when Experiments 1 and 2 are compared, tensile strength, elongation and M100 are superior when DAI-EL G902, which is an iodine-containing polymer, is crosslinked by ultraviolet rays

compared to when a bromine-containing polymer is crosslinked by ultraviolet rays. Particularly, elongation is noticeably improved to at least 2900 %.

The undersigned declares further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

This 26th day of August, 2004

by Etsuo Minamino
Etsuo Minamino

We, the undersigned witnesses, hereby acknowledge that Etsuo Minamino is personally known to us and did execute the foregoing Declaration in our presence on:

Date: August 26, 2004 Witness Katsusada Shiro

Date: August 26, 2004 Witness Minamino Haru